FY 2001 Secretary of Defense Environmental Awards Nomination

Environmental Quality, Non-Industrial Installation

National Training Center & Fort Irwin, California

PM10 Partisol Air Sampling Site

Hazmart Hazardous Material Storage

Hazmart Hazardous Materail Control Center

Fort Irwin Recycling Center

The National Training Center and Fort Irwin, CA
Army Nomination for FY2001 Secretary of Defense Environmental Security Award
Environmental Quality (Non-industrial Installation)

Introduction

As the U.S. Army's premier field-combat training facility, Fort Irwin and the National Training Center (NTC) provide joint and combined arms training in California's harsh Mojave Desert. Located in north-central San Bernardino County, Fort Irwin encompasses 636,182 acres (slightly over 1,000 square miles) of arid basins, dry lakebeds, ridges, and mountain ranges. Approximately half of this area is restricted from training due to various logistical, physiographic, cultural, and environmental concerns. As a result, the installation is acquiring an additional 113,000 acres of adjacent land to better simulate the changing conditions of the 21st-century battlefield.

Fort Irwin and the NTC provide joint and combined arms training in the harsh Mojave Desert.

Fort Irwin challenges visiting units of 4,000–5,000 soldiers monthly with unparalleled force-on-force and live-fire training opportunities. These consist of ten 28-day rotations (approximately 280 days) per year, with each rotation costing up to $10 million. The training played a major role in the development of tactics and the training of troops in Operation Desert Storm. Missions are supported by active duty military and working civilian populations of approximately 4,804 and 3,754, respectively.

Background

Fort Irwin has been an integral part of the central Mojave for over 60 years, and is steeped in both tradition and honor. Initially called Camp Irwin, the facility was created by President Franklin Delano Roosevelt in 1940 and utilized as an anti-aircraft range during World War II. Fort Irwin later became a combat training facility and mobilization center during the Korean War and Vietnam Conflict. It was ultimately designated as the National Training Center in 1981.

Program Summary

The Environmental Division's mission is to conserve, protect, and restore natural and cultural resources while supporting the military mission. Proper environmental management and coordination are necessary not only to comply with federal, state, and local regulations, but also to benefit the overall mission by preventing time delays or operational shutdowns and improving public relations. The environmental management program consists of four general components:

- **Environmental Compliance**—Air quality attainment, hazardous waste/materials management, wastewater discharge, sewage treatment, and noise abatement
- **Environmental Restoration**—Remediation of past contamination, which is performed under the Installation Restoration Program (IRP)
- **Natural and Cultural Resources Management**—Management, conservation, and restoration of the land itself and those renewable natural resources such as deserts and wildlife, as well as historical and archeological resources
- **Pollution Prevention**—Eliminating of pollution to the greatest extent possible, to include reducing hazardous materials use and hazardous waste generation. Prevention is achieved by using less toxic materials or environmentally accepted operations, increasing efficiency, and preventing accidents that result in damage to the environment.

Accomplishments

Air Pollution Control

In 1994, Fort Irwin recognized that it was generating a significant quantity of particulate matter less than 10 microns (PM^{10}) during rotation exercises. As a result, the installation started monitoring six different locations on an Environmental Protection Agency (EPA) six-day schedule. In addition, since 1995, there has been extensive saturation sampling at four other sites for PM^{10}. In 1995, in conjunction with U.S. Army Forces Command (FORSCOM), Fort Irwin initiated a dust study to develop a mechanism to mitigate this problem. By controlling fugitive dust, preventing the exceedence of PM^{10} standards, and maintaining compliance with air quality standards, this ongoing study will ensure that the military can continue to train without restrictions.

PM^{10} Partisol Air Sampling Machine

Since March 1998, Fort Irwin's air pollution mitigation methods have included extensive paving of roads, parking lots and paths; laying of aggregate rock for ground cover; and installation of solar powered street lamps in cantonment and housing areas. In addition, Ft. Irwin's Integrated Training Area Management (ITAM) has completed re-vegetation by seeding and planting shrubs and grasses, treating roads with dust-reducing products, and enhancing soil stability with biological crusts. Eighty-two permitted emission source sites are issued on Fort Irwin for use of boilers, generators, spray painting equipment, storage tanks, fire pumps, and various other machinery. In 2000, the NTC successfully transitioned from using chlorine in wastewater treatment to using sodium hypochlorite. Chlorine use is no longer a factor in Fort Irwin's Risk Management Plan. These measures increase the quality of life for soldiers and families by improving air quality and allowing maintenance of training and garrison areas for future use.

The NTC's efforts have not gone unrecognized. The Mohave Desert Air Quality Management District awarded the NTC an Exemplar Award for three consecutive years (1999–2001). This district-wide award is given to organizations that demonstrate an exceptional commitment to clean air through developing voluntary air pollution prevention and control efforts. Selection is based on a program's quantifiable air-quality improvements, innovative approaches, long-term benefits, sound

environmental philosophy, and replicability. Fort Irwin, through partnerships with ITAM, Directorate of Public Works, Anteon Corporation, Army Corps of Engineers, Johnson Controls, and Pacific Northwest National Laboratory (PNNL), has evaluated and implemented substantial measures to decrease airborne pollution at the installation.

Water Pollution Control

Bicycle Lake Well Field Booster Station

Fort Irwin is a desert community, where summertime temperatures often exceed 115°F, and relative humidity hovers around 20% for most of the year. Transpiration averages 75 inches of water annually. In this extreme environment, water is a very valuable resource. Fort Irwin's Water Program seeks to protect and conserve this precious commodity to ensure clean water for the NTC mission and the Irwin community into the next century. The program does this through:

- production of fresh water from wells
- purification and supply of drinking water along with "domestic" water in a dual water system
- collection and treatment of 1.2 million gallons a day of municipal wastewater
- conservation, pollution prevention, and monitoring efforts

Fort Irwin's drinking water must be treated by reverse-osmosis filtration due to high fluoride levels. In 1998, this process underwent modifications to change the type of membrane used. This simple change allowed Fort Irwin to eliminate storage of **500 gallons (100%)** of sulfuric acid from a housing area, saving approximately **166,000 kilowatt-hours** of electricity and almost **33 million gallons** of water annually—equal to 3% of total production.

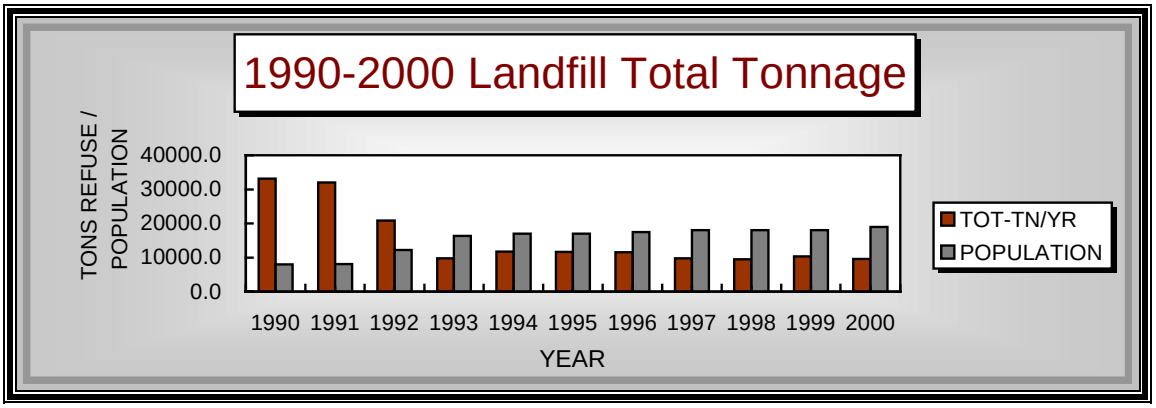
Fort Irwin treats its wastewater through a secondary extended aeration system to a level that allows use for irrigation and dust control without human contact. Improvements in 1999 eliminated sewage spills at the plant, improved influent quantity measurement and sampling collection, and **eliminated 8,000 pounds (100%)** of gaseous chlorine with sodium hypochlorite generators.

Closed-Loop Wash Rack System

Fort Irwin washes as many as 6,000 tactical vehicles a month on wash racks. Prior to 1996, the wash racks were in a general state of disrepair, consisting mainly of hoses on hose bibs draining into sludge basins, with ineffective oil skimmers. At the rate of 20 gallons per minute per hose, a single rotation used 1.5 million gallons of water for the regeneration process. In addition to this waste, the sludge basins created ideal conditions for the propagation of hydrogen sulfide–generating bacteria. In 1995, more than 70 contract workers lost time due to reported exposure to hydrogen sulfide. In 1996, Fort Irwin undertook an extensive repair and refurbishment project to modify the wash racks. The systems now use advanced oil/water separators, backwashing sand filters, bag filters, and ozone generators to filter, purify and recycle all wash water through a closed-loop wash rack system. During FY00, Fort Irwin built a state-of-the-art 26-bay, closed-loop wash rack system. Rotational units can now wash 72 vehicles at a time, thereby saving time during regeneration. Due to these modifications, **approximately 11 million gallons of water, or 1% of total production, are conserved per year**.

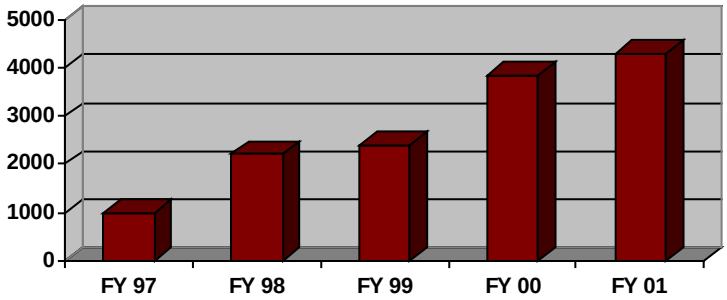
Waste Management and Resource Recovery

Fort Irwin is among the first installations to exceed the Department of Defense (DoD) goal of **a 40% diversion of all solid waste** currently generated by the year 2005. Fort Irwin also exceeded the California requirement to reduce the 1990-baseline disposal of non-hazardous solid wastes by 50% by the year 2000. Fort Irwin diverts solid wastes from the landfill by processing them through the installation recycling center and composting facility.



Fort Irwin Recycling

Fort Irwin has a state-of-the-art commingled recycling program, providing blue containers to housing occupants and offices to deposit all recyclables, which are then sorted at the recycling center. This has resulted in an increase of more than 400% for material being recycled from 1997–2001.



Amounts of materials recycled, in tons

Materials Recycled

- paper (writing paper, newspaper, computer printouts, and cardboard)
- cans (aluminum and steel)
- plastics (milk jugs, soda bottles, detergent bottles)
- glass (clear, amber, and green glass)
- concertina wire
- heavy grade plastics
- toner cartridges
- anti-freeze
- used motor oil

Fort Irwin continuously provides training to enhance public awareness of recycling procedures. The Environmental Division publishes articles in the post newspaper and celebrates Earth Day and America Recycles Day with the elementary schools. Fort Irwin is a remote installation; the cost to deposit one ton of trash in the landfill is $178.00, and the cost to recycle one ton of trash is $78.00. In addition to the sales, the overall cost savings from the recycling program includes the cost avoidance of reduced landfill operation, which was **$384,694** in FY00 and **$430,000** in FY01.

Compost Facility

Our composting program spans three areas of environmental concern: solid wastes, air quality, and water conservation. As the NTC, Fort Irwin annually produces around 20,000 cubic yards of wood waste in the form of pallets, ammo boxes, and target scrap. In the past,

the wood was periodically burned, which generated smoke for months. In addition, the Fort Irwin community annually produces about 10,000 cubic yards of green waste annually, which was formerly stockpiled at an unauthorized dumpsite on post. The wastewater treatment plant produces about 900 tons of Class A sewer sludge annually, which was formerly landfilled at a cost of $178 per ton.

The compost facility resulted from Fort Irwin's desire to dispose of its waste streams in an environmentally friendly manner. Currently operating under a pilot program, it uses an in-vessel technology known as the **Ag-Bag system**, which places the composting material inside a plastic bag that is 500 feet long and 10 feet in diameter. Air is introduced into the bag to control the temperature. The wet composting material is put in the bags, and the moisture is held in for the duration of the processing. As a result, water resources are conserved. During FY00–FY01, Fort Irwin diverted **1,800 tons** of sewage sludge and **40,000 cubic yards** of waste wood, or **100% of these waste streams.**

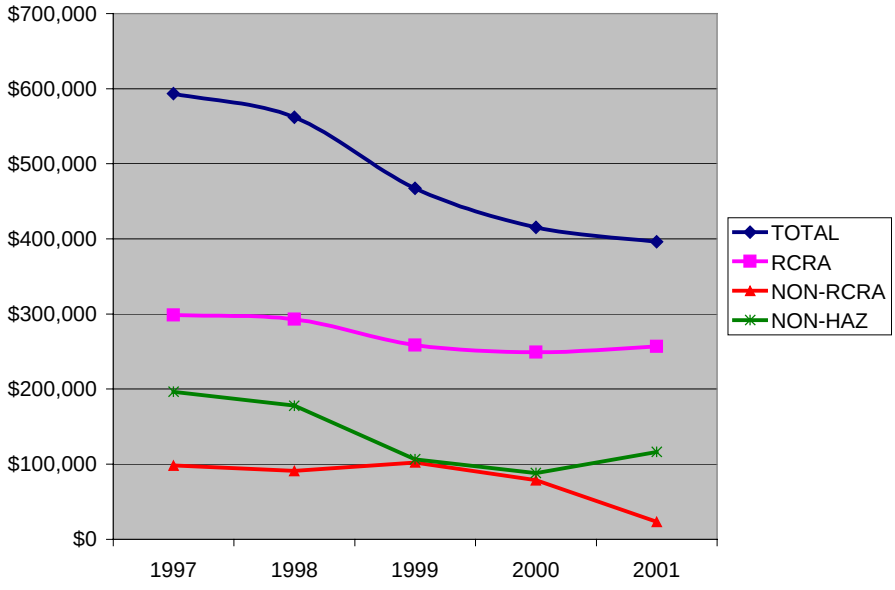
Composting Eco Pods

Toxic and Hazardous Waste Management

Sources: Our primary source of hazardous waste is the operation and maintenance of military support vehicles. Hazardous substances include petroleum, oil, and lubricants (POL) products such as diesel fuel, motor oil, JP-8, used oil, hydraulic oil, anti-freeze, degreasing solvents, and battery acid. Contaminated soils are generated primarily from field exercises where JP-8 and other POL spills may occur. Fort Irwin produces approximately 4,200 tons of POL–contaminated soils per year. Waste is also generated from the routine servicing of the installation's wash racks.

Management: Hazardous waste occurs at approximately 70 sites on Fort Irwin. The Hazardous Waste Service Contractor collects the waste from the sites every six to seven weeks and transfers it to one of two consolidation points: Building 630 or Building 703. In 1999, Fort Irwin applied for and received a waiver to circumvent the Defense Reutilization and Marketing Office (DRMO) and now independently arranges for the disposal of installation-generated hazardous waste.

Fort Irwin regularly inspects all 70 sites for regulatory compliance. Inspections are conducted by the Hazardous Waste/Material Handler or Manager assigned at the unit level on daily, weekly, monthly, and quarterly schedules. Inspections have helped Fort Irwin to stay in compliance; in fact, Fort Irwin boasts a perfect track record of **zero notices of violation** (NOVs) issued for **five consecutive years**. During



The combined effect of P2 initiatives on NTC waste disposal costs amounted to a 30% reduction in disposal costs from 1997–2001

this time, Fort Irwin had numerous regulatory inspections, including a multimedia inspection from the EPA Region IX.

Minimization: The NTC and Fort Irwin have proactively reduced hazardous waste costs by implementing a comprehensive, integrated approach to waste management. Under this approach, pollution prevention measures are incorporated into daily activities at several levels across a broad range of multi-functional users. The result of this cradle-to-grave management philosophy has been a substantial annual cost savings of approximately **$2,000,000**. This broad accomplishment has improved mission readiness and soldier quality of life without compromising environmental concerns.

Environmental Education

The NTC and Fort Irwin have established a Hazardous Materials/Waste Handler's Training Program, required for all unit Environmental Awareness Officers, Hazardous Materials/Waste Managers, Hazardous Materials/Waste Handlers, and their alternates. The training consists of an initial 40-hour course, with an eight-hour annual refresher class. During the past year, **over 300 soldiers and civilian contractors** were trained. This course has been approved by the Barstow Community College, and personnel satisfactorily completing it are eligible to receive 2.5 hours of college credit.

Fort Irwin has established another training program required for all incoming rotational environmental clean-up teams to ensure they receive the hazardous materials/waste spill response training mandated by the State of California. A total of 220 rotational unit soldiers received this training in 2001. During the last two years, the NTC exported its rotational training program to Army National Guard Units. An instructor travels to the state headquarters for the guard unit and trains their environmental clean-up personnel in spill response during a drill weekend, six months prior to their rotation. This ensures they have time to train as a unit for spill response prior to deployment to the NTC. A total of 160 guardsmen have been trained since the program began—resulting in the two National Guard units having the **lowest dollar and tonnage totals** for contaminated soil of any NTC rotation.

Fort Irwin has also developed a community education and public awareness program. The installation has established an educational display, and published educational materials such as soldier pocket books and brochures on endangered species, air quality, cultural resources, and native wildlife.

Hazardous Material Control Center

The HAZMART effectively reduces waste generation and improves compliance by centralizing purchase, storage, distribution, and management of hazardous materials. Since implementing the HAZMART program, Fort Irwin has greatly reduced the volume of hazardous materials stored at individual shops and has seen material turn-in/re-use options become available.

UNITS	FY00	FY01	Totals
Rotations	$135,474	$162,895	$298,369
Fort Irwin	$90,611	$87,863	$178,474
Total Cost Savings: $476,843			

Summary of savings in terms of the value of free issue items used by the NTC and rotation

Anti-freeze Recycling

Fort Irwin initiated an anti-freeze recycling program in 1997. The table below summarizes the cost savings achieved through this program.

FY	Recycle Cost/gal	Recycle Cost-Total	Virgin Cost-Total	Disposal Cost-Total	Gallons Recycled	Total Savings
1997	$2.62	$31,125.60	$59,400.00	$13,305.60	11,880	$41,580.00
1998	$2.80	$28,028.00	$50,050.00	$11,211.20	10,010	$33,233.20
1999	$2.99	$41,907.84	$70,080.00	$15,697.92	14,016	$43,870.08
2000	$3.20	$81,200.00	$126,875.00	$28,420.00	25,375	$74,095.00
2001	$4.00	$54,600.00	$68,250.00	$15,288.00	13,650	$28,938.00
FY97–FY01 Total Savings: $221,716.28						

Re-Refined Oil

In FY00, Fort Irwin implemented the DLA Closed-Loop Re-refined Oil Program (CLROP). Used oil is consolidated by the installation Hazardous Waste Service Contractor and is then picked up by the DLA contractor for re-refining at no cost. The re-refined oil is then purchased in bulk and pre-packaged containers from the DLA contractor through the HAZMART. HAZMART personnel re-package the bulk material into customer-requested quantities to facilitate standard operations. The program is saving approximately $50,000 a year through the reduction of used oil disposal and the reduced price of purchasing re-refined products.

FY	Qty. Waste Oil Disposed of through CLROP (no cost)	Former Disposal Cost through DRMO ($0.87 gal)
2000	13,481 gallons	$11,728.47
2001	88,136 gallons	$76,678.32
Total CLROP Disposal Cost Savings: $88,405.92		

Propane Gas Recovery

The NTC rotational units generate large quantities of partially used propane cylinders (used for heating and cooking). These propane cylinders were previously accumulated at the end of every rotation for disposal as hazardous waste. Disposal costs through DRMO averaged $123.00 per cylinder. In 1996, Fort Irwin partnered with the installation's hazardous waste service contractor (HAZCO) to develop a closed-loop system that evacuates and recovers the remaining propane from each cylinder. The recovered gas is then reintroduced as usable product by repackaging it in refillable containers. Valve stems pulled from the empty cylinders are recycled as scrap metal. The total cost for this action is $1.97 per cylinder. As of August 2000, Fort Irwin has processed 53,266 propane cylinders at a cost of $1.97 per cylinder—instead of DRMO's rate of $123.00 per cylinder. The cost savings from October 1997 to August 2001 was approximately **$7 million**. A total of **600 gallons of propane** has been recovered and reused, and a total of **57 tons of metal** has been recycled.

Propane Cylinder Recycling	FY00	FY01	TOTALS
Used Cylinders	5,051	3,946	8,997
Pounds of Scrap	9,311	7,463	16,774
NTC Cost	$9,950.47	$7,773.62	$17,724.09
DRMO Cost	$621,273.00	$485,358	$1,106,631
Savings	$611,322.53	$477,584.38	$1,088,906.91

POL–Contaminated Soil Recycling and Land Farm Operations

NTC has ten rotations a year and generates over 4,200 tons of contaminated soil (CS) from POL spills caused by training vehicle maneuver accidents. Before 1996, NTC disposed of the CS off-post at $0.09/pound. Fort Irwin also has 150,000 tons of CS stockpiled as a result of regulatory changes that altered past disposal practices. In 1996, Fort Irwin initiated a two-part solution to resolve the situation. A POL bioremediation land farm was constructed to treat CS generated from current and future fuel spills. Bioremediation at the land farm costs $0.06/pound, and the treated soil is used as alternate daily cover in our landfill. The following chart summarizes the savings Fort Irwin has achieved through land farming.

Options	1999	2000	2001
Cost of Disposal through DRMO	$795,960	$756,360	$740,160
Cost of Land Farming	$530,640	$504,240	$266,720
Annual Savings	$265,320	$252,120	$246,720
Three-Year Total Savings: $762,160			

Second, in cooperation with Cunningham Davis Corporation (CDC), Fort Irwin developed a way to incorporate the CS in a cold-mix asphalt process. The product was then used to pave roads, maintenance areas, and parking lots. This process encapsulates the POL contaminants in the CS. To date, Fort Irwin has depleted **19,035.1 tons** of existing CS. This process saves **40% of the cost of CS disposal**, plus the cost of paving with new asphalt, and provides a usable product.

Environmental Compliance Assessment and Management Program

The NTC participated in an Environmental Compliance System (ECAS) assessment in March 1999, massing 140 findings with nine positive findings. Issues consist of Positive, Management Practices, Health and Safety, Pollution Prevention, and Risk Reduction. No findings of immediate danger to the environment were determined. Of the 140 findings, 127 were closed. Although correction of the findings was estimated to cost over $9 million, proactive measures allowed closure of all but 13.

Fort Irwin's Environmental Division maintains a proactive approach to compliance, evidenced by no NOVs, fines, or other regulatory action being issued against the installation since 1997.

National Environmental Policy Act (NEPA)

The NTC complies with all NEPA requirements and has completed Environmental Assessments for the Integrated Natural Resource Management Plan (INRMP) and the Integrated Cultural Resource

Management Plan (ICRMP), as well as for many Records of Environmental Consideration for smaller projects on the installation. Fort Irwin is currently writing Environmental Impact Statements (EIS) for current operations and for the proposed land expansion. The NTC emphasizes the need for early involvement in the planning process at Environmental Quality Control Council meetings.

Project Summary

Program	Annual Cost Avoidance, if applicable (Average)	Performance Metric
Water Pollution Control	N/A	Change in reverse osmosis filtration membrane eliminated 500 gallons of sulfuric acid, saved 166,000 kwh, and resulted in annual savings of 33 million gallons of water
Closed Loop Wash Rack	N/A	6,000 tactical vehicles per month; new 26 bay wash rack saves 11 million gallons of water annually
Recycling	$407,347	400% increase for recycling in five years—an average of 80% per year over the baseline in FY97
Compost Facility	N/A	20,000 cubic yards wood waste annually; 10,000 cubic yards green waste annually; 900 tons class A sludge; diversion of 2,00 tons of age sludge and 40,000 cubic yards waste wood in FY00-01
Toxic and Hazardous Waste Management - Contaminated Soil	$254,053	4,200 tons contaminated soil (CS) produced/bio-remediated per year; 19 tons CS depleted (recycled) to date; 40% of disposal cost saved
Hazardous Waste Accumulation, Handling, and Disposal	N/A	No NOVs in five years—well ahead of the FORSCOM Zero NOV goal by FY05
HazWaste Minimization	$2,000,000	30% reduction in disposal costs over 5 years
HAZMART	$238,420	HW solvent waste stream reduced 99% since 1992 baseline year (from 143 tons to less than 1 ton)
Anti-freeze recycling	$44,340	Average annual recycling of 15,000 gallons of anti-freeze
Re-refined Oil	$44,200	50,808 gallons (average gallons/year for FY00 and 01) disposed through closed loop re-refined oil program
Environmental Education	N/A	300 people HM/WH Training program and 220 received HM/Waste Spill Response training
Total annual cost avoidance (average): $2,988,360		

Conclusion

Fort Irwin has consistently set goals beyond the minimum requirements and continues to raise performance levels. Fundamental milestones have been attained, including exceeding of the DoD 40% solid waste reduction goal and meeting the FORSCOM zero-defect policy for NOVs during the past five years. Fort Irwin realized a 30% reduction in hazardous waste disposal costs, achieved water use savings of 44 million gallons per year, and achieved energy use savings of 166,000 kwh per year. Through the development and implementation of innovative management and educational programs, Fort Irwin's accomplishments demonstrate the installation's true commitment to continual improvement in environmental quality.